

Development of Tools and Techniques for Processing STORRM Flight Data

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While at JSC for the summer of 2011, I was assigned to work on the sensor test for Orion relative-navigation risk mitigation (STORRM) development test objective (DTO). The STORRM DTO was flown on-board Endeavor during STS-134. The objective of the STORRM DTO is to test the visual navigation system (VNS), which will be used as the primary relative navigation sensor for the Orion spacecraft. The VNS is a flash lidar system intended to provide both line of sight and range information during rendezvous and proximity operations. The STORRM DTO also serves as a testbed for the high-resolution docking camera. This docking camera will be used to provide piloting cues for the crew during proximity operations. These instruments were mounted next to the trajectory control sensor (TCS) in Endeavour's payload bay.

My principle objective for the summer was to generate a best estimated trajectory (BET) for Endeavor using the flight data collected by the VNS during rendezvous and the unprecedented re-rendezvous with the ISS. I processed the raw images from the VNS to produce range and bearing measurements. I then aggregated these measurements and extracted the measurements corresponding to individual reflectors. I combined the information contained in these measurements with data from the Endeavour's inertial sensors using Kalman smoothing techniques to ultimately produce a BET. This work culminated with a final presentation of the result to division management. Development of this tool required that traditional linear smoothing techniques be modified in a novel fashion to permit for the inclusion of non-linear measurements.

This internship has greatly helped me further my career by providing exposure to real engineering projects. I also have benefited immensely from the mentorship of the engineers working on these projects. Many of the lessons I learned and experiences I had are of particular value because then can only be found in a place like JSC.



Figure 1 - Me processing flight data at my desk.